Final Examination

Note: These solutions are to the exam Chris Ragan created for use with Lipsey/Ragan, *Macroeconomics*, 10th Canadian Edition.

Part 1. Small Questions. (30 points — approximately 30 minutes)

For each of the following, define the item/concept and explain its significance in terms of macroeconomics. Each question is worth 6 points (approximately 6 minutes).

1. Flexible exchange rates

Suggested answer:

A system in which the value of a country's currency exchange rate is determined mainly by free-market forces rather than being determined mainly by central-bank policy and interventions in the foreign-exchange market. In the case of a "purely" flexible exchange rate, the central bank never participates in the foreign-exchange rate, and thus the official financing account in the balance of payments is exactly zero.

With a system of flexible exchange rate, the exchange rate becomes of the key endogenous macroeconomic variables, whose value is determined, and in turn helps to influence, by activity in the domestic and world economy. For example, a slowdown in the world economy can be expected to cause a reduction in demand for raw materials. As Canada is a net exporter of raw materials, this will cause a reduction in demand for the Canadian dollar and thus a depreciation in its value.

2. Long-run aggregate supply (LRAS) curve

Suggested answer:

The LRAS curve shows the long-run — after the full adjustment of factor prices to output gaps — relationship between the price level and the level of output that firms wish to supply. The LRAS curve is vertical in a standard AD/SRAS diagram, reflecting the long-run independence of aggregate supply to the price level.

The importance of the LRAS curve is in determining the long-run level of real GDP. Following an AD or SRAS shock, the subsequent output gap sets in motion the process of factor-price adjustment, which then shifts the SRAS curve until real GDP adjusts so that the output gap is zero.

In the very long run, capital accumulation, labour-force growth and technological change determine the position of the LRAS curve and thus the level of real GDP.

3. Total Factor Productivity

Suggested answer:

TFP is a measure of productivity based on output per "total input" rather than just output per unit of labour or output per unit of capital. The growth rate of TFP is estimated, following the methods pioneered by Robert Solow in 1957, by estimating the amount of output growth due to measurable factors of production — like labour and capital — and subtracting this from total output growth. Thus growth in TFP is really the "unexplainable" part of output growth.

Its importance is that much technical improvements in producing output — which lie at the heart of long-run improvements in living standards — appear in the data as TFP growth. Some economists even go so far as to view TFP growth as a rough measure of the amount of technical change, but since much technical change is embodied in new capital equipment, TFP growth is, at best, an unreliable measure of technical change.

4. Open-market purchases

Suggested answer:

An open-market purchase means that the central bank enters the bond market and purchases bonds. In return, the previous bond holder receives cash, either electronically or physically. This is new cash in the banking system and its presence sets in motion an expansion in commercial bank deposits, an increase in the domestic money supply, a reduction in interest rates and an increase in economic activity.

More generally, open-market operations are the transactions that central banks make in their domestic bond markets as a means of influencing the rate of growth of the domestic money supply, which in turn influence interest rates, exchange rates, the level of economic activity, and the rate of inflation. In short, open-market operations are a key tool in the conduct of monetary policy.

5. Automatic fiscal stabilizers

Suggested answer:

Automatic fiscal stabilizers are aspects of the tax-and-transfer system that automatically — without an explicit policy decision being made at the time — change desired aggregate expenditures in such a way as to offset shocks in the level of national income. For example, following a positive shock to national income, the income tax system collects more tax revenue and thus dampens aggregate demand. Also, as national income rises, there is typically a reduction in social assistance and unemployment insurance payments, thus dampening aggregate demand. The dampening of aggregate demand will have the effect of reducing national income, thus offsetting the initial positive shock. Conversely, a negative shock to national income means that tax revenue will fall and support payments will rise, thus stimulating aggregate demand. This stimulus will tend to raise national income and offset the initial negative shock.

Such automatic stabilizers are important because they reduce the simple multiplier and make the level of domestic economic activity less susceptible to external shocks. It also explains how international trade and government with taxes makes the multiplier smaller than it would be in an economy with only domestic consumption and investment.

Part 2. Big Questions. (60 points — approximately 60 minutes)

Answer each of the four questions in this section. Each question is worth 20 points (approximately 20 minutes).

6. A simple model of national-income determination in a closed economy with a constant price level and interest rate is presented below. C is desired consumption, I is planned investment, G is government purchases, T is government tax revenue (net of transfers), Y is GDP, and Y_D is disposable income:

$$C = 450 + (0.75)Y_D$$
$$Y_D = Y - T$$
$$T = 20 + (0.4)Y$$
$$I = 80$$
$$G = 200$$

a) Construct the AE (aggregate expenditure) function, plot it on a diagram and label all relevant points, intercepts, and slopes.
b) Solve for the equilibrium level of GDP.
c) What is the value of the simple multiplier in this model? Explain what this means.

Suggested answer:

a)

In a closed economy, the AE function is given by AE = C + I + G. This gives us:

AE = 450 + 0.75(Y – 20 - .4Y) + 80 + 200 which is simplified to be:

AE = 730 – 15 + .75(.6)Y

AE = 715 + .45Y

Plotting this AE function on the usual diagram yields a straight line with slope equal to .45 and a vertical intercept of 715.

b)

The equilibrium level of real GDP is defined to be that level of Y such that Y = AE. We therefore have:

Y = 715 + .45Y which can be rewritten to be .55Y = 715 which implies that Y_E = 715/.55 = 1300.

c)

The value of the simple multiplier is 1/(1-.45) = 1/.55 = 1.82. This means that a $1 billion increase in autonomous desired aggregate expenditure will increase the level of equilibrium real GDP by $1.82 billion.

7. Using a standard AD/SRAS model of a closed economy, analyse the short-run and long-run effects of an increase in desired saving by the private sector. Explain carefully how the paradox of thrift appears (or does not appear) in your analysis. Use an appropriate diagram in your explanation.

A good answer should include the following points:

- **An autonomous increase in private saving shifts the AE function down and reduces the equilibrium level of real GDP (holding constant the price level and interest rate).**
- **Explain the paradox of thrift — that the desire for all individuals to increase their own saving leads to a reduction in equilibrium GDP but, in the simplest model with constant price level and interest rates, to no change in aggregate saving.**
- **When interest rates and the price level are endogenous, the shock is best illustrated by a leftward shift in the AD curve, with the result that P and Y both fall in the short run.**
- **A negative output gap open up, sets in motion a process of declining factor prices, and the SRAS curve shifts down until real GDP returns to its initial level.**
- **In the long run there is no paradox of thrift. The decline in P brings with it a decline in interest rates and thus an increase in investment and a restoration of the initial level of real GDP.**

8. Explain, and show in a diagram, the long-run relationship (i.e., after factor prices have fully adjusted) between desired saving and desired investment in:

a) a closed economy;
b) an open economy with perfect international mobility of financial capital.

A good answer should include the following points:

- **The most appropriate diagram for this question is the one showing the market of loanable funds on the horizontal axis and the real interest rate on the vertical axis. An investment demand curve is downward sloping for all of the "usual" reasons. An upward sloping national saving curve (which equals private saving plus the government budget surplus) reflects the fact that a rise in interest rates leads consumption to fall, thus increasing the flow of private saving. Since this effect is likely to be small, the national saving curve is likely to be quite inelastic.**

- **Note that the money supply does not enter this diagram at all. This reflects the fact that it is a long-run diagram, in which real GDP is equal to its potential Y*, and money is neutral in the sense that changes in the money supply have no long-run effect on real GDP.**

- **In the closed economy, the long-run real interest rate is determined by the intersection of the investment demand curve and the national saving curve. The long-run relationship, therefore, between desired saving and desired investment is that the two are exactly equal. Changes in desired saving will, through an interest-rate adjustment, bring about an equal change in desired investment. Similarly, changes in desired investment will, through an interest-rate adjustment, bring about an equal change in desired saving.**

- **In an open economy in which financial capital is very mobile across borders, the real interest rate is determined in the world market for loanable funds. There is no requirement that desired investment equal desired saving in the domestic economy — the gap between the two can be loaned to or borrowed from the rest of the world, and this represents the current account balance. Thus, there is no necessary long-run relationship between desired saving and desired investment in such an economy.**

Part 3. Really Big Questions. (90 points — approximately 90 minutes)

Answer the following two questions. Each question is worth 45 points (approximately 45 minutes). Provide your answers on the following pages.

9. There has been much debate in recent years about whether Canada should maintain its current regime of flexible exchange rates or instead fix the value of its currency to the U.S. dollar. Write an essay that clearly and logically presents both sides of the debate, in terms of the benefits and costs to Canada of each alternative policy regime.

A good answer should include the following points:

- **The benefits of fixing the exchange rate are (1) the reduction in uncertainty and the resulting increase in cross-border trade and investment that would naturally result and (2) the elimination of currency-conversion costs that would occur if Canada went so far as to adopt the U.S. dollar — an extreme version of fixing the exchange rate.**
- **The benefits of flexible exchange rates are (1) that Canada can pursue its own inflation/monetary policy and (2) that the exchange rate is free to act as a "shock absorber" in response to shocks in the global economy, such as changes in raw materials prices.**
- **One problem in this debate is that both the benefits of fixity and the benefits of flexibility are difficult to quantify.**
- **Another thing to consider is that the cost-benefit analysis may yield a different answer in the future than it yields today, especially if the structure of the Canadian and US economies continue to become more similar.**

10. Consider the following model of aggregate demand and aggregate supply in an open economy (with a given nominal exchange rate). Y is real GDP, P is the price level, NX is the flow of net exports, and Z is the world price of oil.

Aggregate Demand: $Y_{AD} = 650 - 60P + 7NX$

Aggregate Supply: $Y_{AS} = 40 + 20P - 5Z$

a) Explain carefully the economic logic of each equation.
b) Solve for the short-run macroeconomic equilibrium values of Y and P.
c) Explain, and show in a scale AD/SRAS diagram, the short-run effects of a dramatic reduction in OPEC oil production that drives up the world price of oil. What are the long-run effects of this shock?
d) Explain, and show in a scale AD/SRAS diagram, the short-run effects of a large recession in Europe that reduces European demand for Canadian-produced commodities. What are the long-run effects of this shock?

A good answer should include the following points:

a)
In the AD curve: a decline in P raises the level of aggregate demand because as P falls, the demand for money falls, the interest rate falls, and investment demand is stimulated. A rise in export demand raises the level of aggregate demand directly. The coefficient on NX (7) shows the value of the simple multiplier: a $1 increase in NX increases the equilibrium level of real GDP in the simplest macro model by $7.

In the SRAS curve, a rise in P raises the flow of aggregate supply for the simple reason that as P rises real wages (and other factor prices) fall and thus firms are led to hire more labour and increase their output. An increase in the price of oil increases costs for firms and, other things equal, reduces their profitability and thus their supply of output.

b)
The macroeconomic equilibrium is found where $Y_{AD} = Y_{AS}$. Thus, 650 - 60P + 7NX = 40 + 20P – 5Z or:

610 + 7NX + 5Z = 80P . The equilibrium price level is therefore P_E = 610/80 + (7/80)NX + (5/80)Z. This can be simplified to be

P_E = 7.63 + (7/80)NX + (5/80)Z

That is, the equilibrium P rises if NX rises (AD shifts to the right) and also if Z rises (SRAS curve shifts to the left).

The equilibrium level of real GDP is then found by substituting the equilibrium P into either the AD or SRAS curve. This gives:

$Y_E = 650 – 60(P_E) + 7NX$

Y_E = 650 – 457.8 + 1.75NX – 3.75Z

That is, the equilibrium level of Y rises when NX rises and fall when Z rises.

c) Following a rise in Z, the short-run effect is an upward shift in the SRAS curve which generates a fall in Y and a rise in P. There is a recessionary output gap which begins to put downward pressure on wages and other factor prices, and thus eventually shifts the SRAS curve back toward its initial position. Output will return to its initial level (Y*) and so will the price level. But real wages are lower in the new long-run equilibrium than they were in the initial one.

d) The European recession reduces NX for Canada and thus creates a leftward shift in the AD curve in Canada. The short-run effect is to reduce Y and P and open up a recessionary output gap. This will put pressure on wages and other factor prices to fall and thus for the SRAS curve to shift downward. Output will eventually return to its initial level (Y*) and the price level will fall.

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